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CONVULSIVE
AFFECTIONS IN CHILDREN
AND THEIR TREATMENT.

BY

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Reprinted from THE MEDICAL RECORD, *June 2, 1883.*



NEW YORK:
TROW'S PRINTING AND BOOKBINDING CO.,

201-213 EAST TWELFTH STREET,

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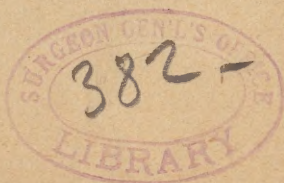
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CONVULSIVE AFFECTIONS IN CHILDREN AND THEIR TREATMENT.

CHILDREN, from infancy to the age of five years, are especially liable to convulsive attacks, and those beyond that age, when of a highly nervous organization, are frequently affected. This peculiar susceptibility to convulsions is supposed to be owing to the highly irritable nature of the growing cerebro-spinal system. It is moreover largely influenced by certain inherited tendencies, especially affecting the nervous centres, which act in the nature of predisposing causes.

Convulsions in children occur as a complication and often as a symptom of numerous diseases. They may also be produced by local mechanical irritation. In general terms they may be said to depend for their primary cause upon an irritation of certain nerve-centres in the medulla, modified, perhaps, by a want of control on the part of certain inhibitory centres, which in the young child are not fully developed. This irritation may be produced directly by the action of the blood under certain conditions of quantity and quality, or indirectly through reflex transmission of peripheral impressions. The secondary or immediate cause may be said to be due to the peculiar susceptibility of the medulla to disturb-

ance produced by the quality of blood flowing to it ; and this may be influenced either by chemico-vital changes of that fluid occurring in the body at large, or by the quantity of blood supplied, which supply is controlled by the action of local vaso-motor mechanisms upon the heart and upon the calibre of the blood-vessels in distant parts. This quality consists in either an excess of carbonic acid or a deficiency of oxygen in the blood supplying the brain.

Convulsions produced in animals by the inhalation of carbonic acid gas are an illustration of the one, and convulsions from a large and sudden loss of blood an illustration of the other.

I therefore propose to arrange the convulsive affections of children under two grand divisions, viz.: those due to peripheral or local irritations, and those due to central or circulatory causes.

I do not recognize the class of convulsions in children commonly called essential, for where no assignable cause for their origin can be discovered, they are in all likelihood, especially when occurring after the third year, epilepsy.

Convulsions in children due to the influence of mental impressions may very properly be regarded as hysterical in their nature. There are certain sources of the local origin of convulsions that are of commoner occurrence than others. The most frequent one in the experience

of every physician is irritation of the gastro-intestinal canal. This is the first cause generally suspected, in the absence of other well-defined and apparent causes, and will bear close scrutiny by the medical attendant. It is commonly due either to an improper quality or too great a quantity of food. More rarely it may be owing to the existence of entozoa, also a loaded condition of the rectum from constipation. Occasionally an intestinal catarrh, arising from sudden changes of temperature, may be the starting-point of the convulsion. Whatever combination of circumstances will lead to indigestion will, in all probability, excite a convulsive attack, the probability increasing with the acuteness of the stomachal disorder. This is, on account of the manner in which the contents of the stomach in children is hastened on into the intestines, where the undigested matter undergoes fermentation, producing gases and distention which excite pain. Occasionally matter which has been wholly unacted upon by the gastric secretions enters the intestines, where it causes mechanical irritation. I have met with a case of convulsions where large pieces of orange-peel were detected in the passages from the bowels. Frequently the irritation proceeds from the stomach, before its contents have passed into the intestines. This occurred in the case of a boy, eleven years of age, whom I attended, where a quantity of sausage had been eaten, and was removed by an emetic. Trousseau mentions a

case where the altered condition of the mother's milk, after she had passed through a state of mental excitement, was sufficient to cause convulsions in her infant, shortly after nursing.

It should not be forgotten that the process of dentition and the rachitic diathesis aid to a great extent as complicating factors in disturbing the function of digestion. This is beyond the part that they assume as independent elements in the causation of convulsions in children.

Dentition may be regarded as next in order of frequency as a source of local irritation causing convulsions in children. By dentition is meant the active process of the eruption of the teeth with the attending pain and general nervous erethism, consequent upon the swollen and congested state of the gum, when this exists. The condition of the nervous system that exists during the entire period of teething, which is dependent upon the alteration taking place in the various organs for a new departure of nutrition, can only be considered as a predisposing cause. There can be little doubt that dentition, as here implied, is a factor in the causation of convulsions, independently of any other element, for it has often been demonstrated on good authority that they have ceased as soon as the tension of the swollen gum was relieved by lancing. It has been disputed by some authorities on the diseases of children, notably Henoeh, that dentition is as common a cause of convulsions as rickets.

While I regard rickets as a prolific source of these attacks, as will be noted further on, there is little doubt in my own mind that, in the majority of cases of convulsions occurring in children suffering from rickets, it will be found that the active process of dentition is the exciting cause, the diathesis acting meanwhile as the predisposing cause. This view is rendered all the stronger from the fact that dentition, although retarded in rachitic subjects, occurs at the time when rickets is at the height of its morbid action.

There are numerous minor sources of local irritation exciting convulsions in children, amongst which can be enumerated, burns, scalds, blisters, severe itching from eczema or other cutaneous eruptions, hardened wax or other foreign bodies in the external auditory canal, foreign bodies in the nostrils, and in fact foreign bodies in any of the animal tissues. Trousseau relates one case where a long needle sticking in the brain and accidentally discovered by the thread attached, produced a series of convulsive paroxysms which ceased as soon as the needle was withdrawn ; and another where convulsions had been caused by a needle found at the autopsy penetrating the liver. He also quotes Underwood, who records a case where a pin piercing the anterior fontanelle was found to be the exciting cause of convulsions, ending in death. Such substances as long hairs or pieces of thread found in the pharynx of young children, have been re-

ported in the journals as the exciting cause of convulsive attacks. Dr. Buzzard in *The Practitioner* (vol. xx., p. 403) has ably demonstrated the mechanism of facial spasms produced by foreign bodies in the external auditory canal, and it is reasonable to infer that a similar degree of nervous disturbance from a like cause would be manifested in the young child by a convulsion.

Under the division made of convulsions due to changes in the quality and quantity of blood supplying the cerebral circulation, fevers occupy the first place in frequency and importance. All fevers are due either to a specific poison circulating in the blood, or to the process of congestion and inflammation. To the first class belong the eruptive fevers of children, such as scarlatina, measles, variola, varicella, and erysipelas, and typhoid and malarial fevers. Each of these may be ushered in by a convulsion corresponding to the chill in the adult. In malignant cases, convulsions often occur some time after the fever has begun, probably from the action of the specific poison. Where this happens in the early stage of scarlatina and the late stage of measles, an unfavorable termination may be expected. Convulsions occurring during the latter stage of scarlatina, it need hardly be said, are of renal origin. Intermittent fever in children, especially in those having a convulsive predisposition, presents a marked illustration of the convulsion taking the place of the chill in the adult. All doubts as to the nature of the

convulsion may be set at rest when it is found to occur periodically, and is followed by high fever and sweating. To the class of fevers arising from congestion and inflammation belong pneumonia, bronchitis, summer diarrhoea and its allied affection heat fever, tonsillitis, and other catarrhal affections. Pneumonia involving the apex of the lung is especially apt to be accompanied with convulsions in children. Vogel regards convulsions in children occurring where the disease is located in certain parts, as due to the reflex irritation of the diseased organ or tissue upon the nerve-centres.

It may frequently be observed that there is no direct relation between the rise of temperature and the manifestation of the convulsion, for in children of a nervous temperament, who are more susceptible to the action of the febrile process than others, a moderate rise of fever, as indicated by the thermometer, is sufficient to induce an attack. Gastro-intestinal irritation and the irritation of dentition are frequently attended with fever. But in such cases it seems reasonable to connect the rise of temperature with the same condition of the vascular mechanism as that exciting the convulsive attack.

Rickets and syphilis are included under the head of circulatory causes, producing convulsions in children, from the fact that in both of these diseases the process of nutrition is seriously at fault, owing either to an increased or imperfect metamorphosis of tissue, the blood necessarily

becoming changed in character. It has been supposed by some writers that the frequent occurrence of convulsions in rickets was in consequence of the softened and elastic cranial bones not offering a proper support to the blood-vessels, so that an undue amount of blood reached the brain. Perhaps it may be well to regard this view as having a certain degree of importance in determining the rationale of convulsions in rickets, though certainly the condition of the blood supplying the brain cannot be slighted. This view becomes all the more tenable when rickets is compared with hereditary syphilis, which it closely resembles in many clinical and pathological features, and which is now well known to be frequently attended with convulsions.

Laryngismus stridulus is the common form of convulsive manifestation in rickets, and may be regarded as an integral part of the disease. It usually is the prelude to a general attack, if not speedily controlled. The interference with the normal oxygenation of the blood by the frequent spasmodic closure of the glottis, presents a marked illustration of the influence of venous stasis in the cerebral circulation producing general convulsions.

Children suffering from rickets are immensely subject to pulmonary and gastro-intestinal complaints. These, as well as dentition, frequently aid as exciting causes to produce convulsions in such children.

The influence of syphilis in producing convulsions in

children may be regarded in many respects as similar to that of rickets. Disease of the cerebral blood-vessels, leading to hemorrhagic extravasations, is probably an additional factor.

In children affected with pertussis, convulsions are the result of mechanical interference with the return of venous blood from the brain, through spasm of the muscles of respiration. Here, as in laryngismus stridulus, the nervous organization is already in a highly irritable condition, and the nerve-centres are easily disturbed by the repeated venous stasis which occurs. Convulsions in children occurring toward the end of summer diarrhoeas, are due to the anaemia caused by the excessive drain upon the blood. Those occurring in the latter stages of pneumonia and bronchitis are from an accumulation of carbonic acid in the blood.

In the early stage of tubercular and simple meningitis, cerebral hemorrhages, tumors, and other cerebro-spinal affections incident to children, convulsions are a frequent symptom. They are then probably due to changes in the cerebral circulation, depending upon irritation of local vasomotor mechanisms. Toward the end of these diseases, however, the convulsions may justly be attributed to changes in the quality of the blood flowing to the brain, the result either of imperfect aëration from irregular breathing, or venous congestion from mechanical pressures.

Every convulsion, however slight and limited, and from whatever cause, should be regarded as dangerous, owing to the tendency to paralysis of the vital centres in the medulla through exhaustive expenditure of nerve-force. Certain forms of the attack may, however, be considered more favorable in their termination than others. Such, for instance, are those occurring at the onset of febrile processes, where there is no complication with the rachitic or syphilitic diatheses nor dentition, and the paroxysms are not repeated. Where the attacks are general, soon over, and single, they have in my experience, proved less dangerous than where they are partial and long-continued. Carpo-pedal contractions should always be regarded as a danger-signal for the near approach of a general convulsive attack, and deserve prompt remedial measures. It occasionally happens that effusions into the ventricles of the brain follow a prolonged attack of convulsions, causing death from coma.

From the previously described etiology of convulsions in children, certain therapeutical indications may be deduced. These, in general terms, are to remove the exciting cause, if possible, assist in restoring the balance of circulation, and quiet the excited nerve-centres. For the proper operation of these measures the child should first of all be entirely undressed, if this has not previously been done, and held wrapped in a light blanket in the nurse's or mother's arms, in a good light. While this

is being done questions concerning the kind of diet, character of the passages from the bowels, previous health, and other pertinent matters, can be rapidly asked. At the same time a careful inspection of the body and the cavities of the nose and ears for foreign bodies can be made. The gums should be examined, also the anterior fontanelle and occiput. The existence of fever and appearance of the skin, especially in the bends of the joints, should be noted for the eruption of scarlatina, and on the forehead and scalp for measles. Inquiry as to any complaint of pain, its seat and character, previous to the attack, should not be omitted. Sufficient information can thus be hastily gathered to base a reasonable method of procedure upon, examination of the lungs not being included, as nothing definite can be discovered thereby, owing to the accumulation of mucus in the bronchial tubes and irregular respiration.

In the absence of any known exciting cause—excluding epilepsy, which rarely occurs before three years of age, is without fever and followed by a more or less prolonged comatose stage—I have always considered it safe practice, especially where the convulsive movements continue, to suspect intestinal irritation; for I have found in several instances that it was possible for the child to have eaten something that the nurse or mother was unaware of or placed small importance upon.

The first thing to be done, therefore, intestinal irritation

being the possible cause, is to administer an enema, which should consist of a pint or more of strong soap-suds with a teaspoonful of salt and a tablespoonful each of molasses and castor-oil. This I usually give myself, the suction end of the syringe, if a Davidson is used, being held by an assistant near the surface of the mixture, so that the oil, as it floats on the surface, may be first thrown into the bowel. Where the enema does not appear to empty the bowels satisfactorily, it is advisable to give a brisk purgative by the mouth, such as three grains of calomel with five of bicarbonate of soda. This should not be given where an emetic has first been used, until the stomach has had time to rest. Besides unloading the intestines, the enema, by its stimulant properties, acts as a derivative in equalizing the circulation, and the calomel often has the effect of reducing temperature accompanying the intestinal disturbance, when due to other than the presence of undigested matter. If the convulsion occurs shortly after a hearty meal or the eating of any very indigestible substance, an emetic is first indicated. The syrup of ipecac or pulverized alum mixed with table syrup can be given, if at hand, or what I generally find more convenient and equally as effective and rapid in action, a draught of tepid mustard-water with salt. This can be administered by the spoonful successfully, with the exercise of a little knack and patience. If the physician carries with him a solution of apomorphia, one-fortieth to

one-twentieth of a grain may be injected hypodermically into the buttocks. The emetic, besides emptying the stomach of its contents, in many instances aids, by its revulsive effect, in checking the convulsive movements.

Frequently it happens that the convulsions continue in a partial manner after the stomach and bowels have been emptied, even where their contents had provoked the attack. This may be owing to the impression that the irritation has left upon the nervous centres. In such a case the bath should be resorted to. And here there appears to be some diversity of opinion among eminent writers on the subject, as to the advisability of the warm, hot, or cold bath. As each may be used with equal propriety, where the occasion demands, it may be well to explain their action upon the cerebral circulation.

Schüller has demonstrated by physiological experiments performed upon rabbits, that the action of a full cold bath is to dilate the blood-vessels of the pia mater, contraction occurring only after a long application of the bath, and then from the blood being cooled down. The full warm bath causes powerful contraction of the vessels of the pia mater, often preceded by a transient dilatation. A very hot full bath produces dilatation, lasting longer, and only causes contraction after the bath has been cooled down to about 86° F. As is well known, the warm bath, of a temperature of 98° F. dilates the cutaneous capillaries, reddens the skin, and produces a

general relaxing effect, while the cold bath contracts the cutaneous capillaries, and is attended with a certain amount of shock. A certain length of time is required for reaction to be restored after the cold bath, and even then with the aid of friction. The cold sheet or rub-down, as described by Winternitz in the *The Practitioner* (vol. xxi., p. 104), rapidly excites dilatation of the cutaneous capillaries when combined with friction or patting, and by pouring cold water over the sheet reduces temperature.

It has been stated that convulsions have been excited again by the application of the hot bath—98° F. to 112° F.—where used to check them. As will be seen by Schüller's experiments, this might readily occur where a congestion of the cerebral circulation already existed, more especially if the precaution was not taken to apply the cold douche or a compress to the head at the time of giving the bath. I have, however, never witnessed such an occurrence, but on the contrary have seen a persistent attack of convulsions from gastro-intestinal irritation cease, after complete immersion in a hot bath, even where chloroform had previously failed to control it.

The practical conclusions to be drawn from the above description of the effects upon the cerebral circulation of the warm, hot, and cold bath, are that the warm bath is indicated where there is reason to infer that a con-

gested condition of the pia mater exists, the hot or cold bath where there is anæmia. Neither should be used too long. In convulsions depending upon fever, where a high degree of temperature exists, also in summer-diarrhœa, the cold bath may be used with advantage, but I think the rub-down previously referred to, with the addition of cold water poured over the sheet, preferable. Hot compresses to the head are, at the same time, advisable in all cerebral affections associated with a condition of anæmia. I have found the cold douche—temperature 40° F. to 60° F.—applied to the spinal column, either while the patient was in the hot bath or immediately after, has proved of considerable service in checking some cases of convulsions.

It has become an established practice to administer an anæsthetic at some time during the convulsive paroxysm. Chloroform is the one most commonly used, as it acts quickly, and in children is harmless when carefully used. Many physicians are in the habit of using it before all other remedies; while others prefer using it after the measures previously mentioned have been tried. The proper method, in my opinion, depends upon the severity of the attack. If these are violent and prolonged, causing the face to become livid, and are frequently repeated, it is best and safest to administer chloroform in preference to using other means, providing there is no easily perceptible local cause of irritation

originating the attack. Otherwise, I consider it better practice to remove the cause first, if possible, and if the attacks continue then to use chloroform.

Nitrite of amyl has been used by Dr. Williams of Boston (*Canada Med. and Surg. Jour.*, September, 1882) with much success in the treatment of laryngismus stridulus, and other writers have reported its use in the general convulsions of children. It has been generally regarded as a highly successful remedy in the treatment of the attacks in epilepsy for some years, and from its well-known physiological action I regard it as being eminently appropriate in the convulsions of children. From three to five drops should be poured upon a handkerchief and held close to the mouth until a general flush of the face and body appears. My experience with it in convulsions has been limited, but I am almost inclined to prefer it to chloroform.

Sedatives may be administered during the attack, or what is better, immediately after, in order to quiet the excitability of the nerve-centres and so prevent a recurrence. Chloral hydrate, either alone in the form of an enema of three to five grains in a half ounce of clear starch, or by the mouth, in combination with bromide of potassium in the proportion of one part of the former to two of the latter, is a favorite treatment, the dose being graduated to the age, and given every two to four hours, according to the urgency of the case. This treatment

will be found of the highest service in convulsions depending upon dentition, the rachitic diathesis, or pertussis. Other sedatives, as belladonna in small and frequently repeated doses, tincture of musk, and oxide of zinc have been recommended. Sulphate of morphia, given hypodermically in carefully regulated doses, may also be used, and, especially in symptomatic convulsions, will be found advantageous. Such cases in the comatose stage may be recognized, according to Parrot (*The Practitioner*, vol. xxix., p. 451), by the fact that if the skin be pinched there will be a momentary dilatation of the pupil to two or three times its previous size. Ordinarily these convulsions are limited to one side of the body.

Where malaria is the cause of the convulsions it need hardly be said that quinia is the main remedy indicated to prevent a return of the attack. Cod-liver oil and the syrup of the lactophosphate of lime should be given where evidences of rickets exist.

Convulsions occurring in the late stage of scarlatina, in addition to the before-mentioned remedies, should be treated with the view of relieving the renal congestion. Dry cups to the kidneys, the hot-air bath, and the internal administration of spirits of juniper with bitartrate of potash will be found useful remedies. Our knowledge concerning convulsive affections in children and their treatment may be formulated as follows :

All convulsions depend primarily either upon a pe-

ripheral or central irritation of vasomotor mechanisms, and secondarily upon a change in the quantity or quality of the blood-supply to the medulla for their causation.

Convulsions, from whatever cause and of whatever degree, involve an element of more or less danger to life, and should be treated promptly.

Where there is any doubt as to the exciting cause of the convulsions, it may be safely treated in the same manner as if from gastro-intestinal irritation.

The treatment should be directed to a removal of the exciting cause, if local, an equalizing of the general circulation and quieting of the excited nerve-centres.

~~30~~ WEST FIFTY-FIFTH STREET.

